

Starting a Civic Engagement Capstone: An Experience Report

Mark Hills and James B. Fenwick, Jr. (Appalachian State University)

38th Annual CCSC:Southeastern Conference (CCSC-SE 2024)

November 1-2, 2024

Furman University, Greenville, SC

Appalachian State's CS Capstone course

- From the catalog:

The senior capstone project provides the student an independent and collaborative software development experience with a significant project. The course introduces aspects of project management, requirements analysis, and the software lifecycle, but will primarily be concerned with the practical integration of core theories, practices, and ethics of the discipline. Writing and speaking communication skills are reinforced.

- Senior-level project course
- Students pick their own projects and teammates, work alone or in small teams, projects generally have a one-semester lifetime
- Emphasis on effective management, design, development, technical writing, and presentation/communication skills

Projects vary significantly!



Origin of the civic engagement section

- Nudge 1: we were approached by a local non-profit to see if we could help them build a client portal for their clients, but this was too big of a task for a student to do in a single semester
- Nudge 2: our teaching center ([CETLSS](#)) published a call for proposals for the *Civic Engagement Innovation Grant*, looking for creative ways to integrate civic engagement into courses
- Nudge 3: the department had a long-running interest in being able to involve students in multi-semester projects with external clients
- Putting these all together, we scheduled a special Civic Engagement section of our Capstone course and applied for (and were awarded!) a Civic Engagement Innovation Grant

Before the semester

- We met with the local non-profit to initially scope out their needs
 - They were expanding their services, wanted a client portal to make it easier to work with their clients
 - Wanted both web and mobile applications, which would need some kind of shared backend
 - Were prepared to provide at least some time from someone at the non-profit to handle some of the needed data, so little integration with their existing systems and not everything needed automation
- Also met with a startup looking to engage students in building prototypes
 - Focused on visualization and “what-if” scenarios that could be useful for talking to investors
 - Wanted a modern web stack
 - Note: we mainly focus on the first client here...

During the semester

- We met a total of 14 weeks, once per week (3 hours per meeting)
- Week 1: Brainstorm questions for clients
- Week 2: Clients visit, presentations and interviews, divide work into teams and bid on team memberships
- Week 3: Start in earnest on projects!
- Weeks 4 through 12: Conduct project work using sprints (see below)
- Week 13: Wind down projects, focus on future teams
- Week 14: Final presentations

Student sprints

- During the semester, work proceeded using an approach similar to Scrum (with us as the Scrum Masters, and us in tandem with the clients as the Product Owners)
- Each sprint was two weeks long
 - Odd weeks: start class with a report of work completed and blockers, end class with a discussion of work to be completed before the next class
 - Even weeks: end of sprint presentations, including specific project aspects (e.g., testing approach, collaboration approach on GitHub) and demos
- Code, issues all tracked using GitHub, shared docs on Google Drive

Ending the semester

- Students presented projects to clients and one another, then gave a more detailed presentation to the instructor
- The instructor visited each client for a debriefing meeting
- Students responded to a survey asking them about their experience, what went well, and what could be improved

The survey, part 1

1. What teamwork skills did you improve, or learn, during the project?
2. How effective do you believe your team was? (1 to 5 scale, 1 is dysfunctional, 2 is ineffective but functional, 3 is sufficient, 4 is effective, 5 is highly effective)
3. What do you believe could have been done better to help your team work together more effectively?
4. What technical skills did you improve, or learn, during the project?
5. What do you believe could have been done better to help you learn new technical skills during the project?

The survey, part 2

6. How much communication was there with the other teams? (1 to 5 scale, 1 is Not Enough, 3 is Just Right, 5 is Too Much)
7. How much communication was there with the client? (Same scale as Q6)
8. Did communication with the client come at the right times? (1 to 5 scale, 1 is at the wrong times, 5 is at just the right times)
9. How did you communicate with the client? (Email, Text, Telephone, Discord, Zoom, In Person, or Other, multiple answers allowed)

The survey, part 3

10. What could be done in the future to improve communication with external clients? What worked well, and what could be done differently?
11. Feel free to share any other thoughts about your experience working on your project.

Survey responses

- Of the 23 students, only 7 responded – the goal for next time is to get this higher (and potentially to track projects, but that risks making the survey less anonymous)
- In general, students thought their teams were effective (3.43/5), with communication between teams that was generally good (2.43/5, with 3 being "just right")
- Communication with the client needed to be improved, with students ranking amount of communication as 1.71/5 (3 is "just right") and timeliness of the communication as 2.57/5 (1 is at the wrong times, 5 is just at the right times)
- A repeated theme in comments is that more communication would have improved the projects

Surveying other programs

1. Does your undergraduate degree require students to take a capstone course near the end of their time in your program?
2. If Yes: Do you allow your students to work on projects with community partners and other outside individuals and/or organizations?
3. If Yes: Do you have projects that last for more than a single term/semester?
4. Would you be willing to either have a short conversation over Zoom with us or answer additional questions about your capstone course? (We still need to do these, let us know if you want to talk!)
5. Do you have any additional thoughts to share about capstone courses, working with external partners/on external projects, or multi-term projects?

Summarizing the responses

- We posted the survey to the SIGCSE mailing list and had a total of 16 responses
- 14 responses had a capstone, while 1 had a significant project; 10 require students to take the capstone course
- All 15 with capstone or project courses allow students to work with external partners, while 13 allow multi-semester projects either by design (e.g., 2-semester capstone sequence) or by student interest
- 7 may have different teams working on the same project over time

Some important take-aways

- Communication is a key challenge
 - Students need time to learn to work well together on their teams
 - Teams need time to communicate in class for issues that cross team boundaries (e.g., shared APIs, feature parity on mobile platforms)
 - Teams need more opportunities to speak with clients, clients need help in giving effective feedback
- Infrastructure is another challenge
 - Students need a place to host the systems they develop, especially when it's needed by other students
 - It's easy to lose track of accounts on helpful products (e.g., Figma, Postman), which risks losing access for future teams
 - Developer accounts can be expensive if needed, e.g., for Apple

Semester 2: what have we seen so far?

- Client time is still an issue, even with a more proactive approach (but note, this semester has been challenging because of Helene and may not be representative)
- Students are doing well in coming up to speed on what was done before, and have been asked to focus on what's missing that would have been useful (often easier to tell in hindsight), but this can still take a significant amount of time
- The move to a VM model in the department has helped with deployment issues, but students often need help with this part
- The pace of change of the underlying web and mobile stacks causes a lot of churn, extra learning time

Wrapping up

- We have started a new Civic Engagement capstone section at Appalachian State with external clients and client-directed team projects
- Student feedback has been quite positive, with many finding it meaningful to contribute to the success of a local nonprofit
- Time management, especially for interactions with the clients, will be key to the long-term success of this model
- We hope to establish something more self-sustaining long term, such as a center that can potentially bring in funding for students

Discussion

Thank you!
Any Questions?

- Mark Hills: <https://cs.appstate.edu/hillsma/>
- Jay Fenwick: <https://cs.appstate.edu/jbf/>